B I D D I N G D O C U M E N T

for

The Work of Design, Engineering, Construction and Commissioning 10 MLD Sewage Treatment Plant with Biological Nutrient Removal (BNR) at Anjanapura-2 BDA layout with 10 MLD TSPS, Pumping Main and Operation & Maintenance for Seven Years.
(DBO contract)

Contract Package – BWSSB - ANJ-2 - BDA

National Competitive Bidding (NCB)

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PART 15

TRAINING AND ADVISORY REQUIREMENTS

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PART 15

TRAINING AND ADVISORY REQUIREMENTS

15.1 Training Requirements

15.1.1 General

The Contractor shall provide comprehensive training for the different categories of the Employer's operation and maintenance staff. Training shall fall into two main types which are 'off the job' and 'on the job'. Off the job training shall take place in the classroom; on the job training shall be carried out on the running plant.

15.1.2 Off the Job Training

The Contractor shall prepare formal training documentation for distribution to the trainees. Visual aids shall be used where possible to illustrate the points being made and to make the training programme as interesting and enjoyable as possible for the participants.

Table 15. 1: Off the Job Training Requirements:

Training Category	Training Requirements
1) Off the Job Training Programme for all Trainees	a) On the simple chemistry, biology and process principles involved in the operation of the Works. b) Health and safety. c) Plant safety procedures. d) On the use of the local and central HMI s.
2) Off the Job Process Training Programme for Plant Operators	a) On the operation of individual items of plant and sections of the Works including automatic operation and manual operation in the event of automatic control failure. b) On the day to day operation of the Works and procedures and trouble shooting. c) On a comprehensive list of "what if" scenarios dealing with the actions to be taken in the event of potential process problems, alarms, plant failures, overflows, power failures etc.. d) On first line mechanical maintenance. e) On safe methods of work general. f) On safety procedures to be followed in operating, maintaining and cleaning the plant. g) On special precautions to be followed in the event of chlorine leak. h) Developing standard operating procedures.
3) Off the Job Training Programme for Electrical Maintenance Staff	a) On the configuration, construction and operation of the electrical Plant. b) On the electrical maintenance requirements of the Works.

Training Category	Training Requirements
	c) On the switching and safety procedures to be followed. d) On safe methods of working. e) On fault finding and repair procedures.
4) Off the Job Training Programme for Control and Instrumentation Maintenance Staff	a) On the configuration, construction and operation of the Plant. b) On the control and instrumentation maintenance requirements of the Works. c) On fault finding and repair procedures. d) On safe methods of working. e) Special training on the use of the PC and associated programming software for fault finding on PLC based control systems. f) Special training on the use and performance of the central HMI SCADA hardware and software and other specialist hardware and software systems used on the plant.
5) Off the Job Training Programme for Mechanical Maintenance Staff	a) On the routine mechanical maintenance requirements of the Works. b) On lubrication requirements of the Works. c) On fault finding, repair and overhaul procedures. d) On safe methods of working.
6) Off the Job Training Programme for Sewage Treatment Management Staff including safety officer	a) Sewage treatment process management techniques. b) Sewage treatment plant cost management. c) Sewage treatment plant laboratory management. d) Safe methods of work general. e) On safety procedures to be followed in operating, maintaining and cleaning the plant. f) Communication strategy and cascading information
Note: *Training shall be mandatory for all AMC vendor packages.*	

15.1.3 On the Job Training

The Contractor shall utilise the Operations and Maintenance Manuals as the primary training aid in carrying out the on the job training. Shortcomings, omissions and errors identified in the O & M Manuals during the training shall be rectified prior to final acceptance of the O & M Manuals.

Table 15. 2: On the Job Training Requirements

Training Category	Training Requirements
a) On the Job Training Programme for all Trainees	a) Plant familiarisation tour. b) On the use of the local and central HMIs. c) Health and safety. d) Identify areas where special safety precautions are necessary.
b) On the Job Process Training Programme for Plant Operators	a) Under operational conditions on the operation of individual items of plant and sections of the Works including automatic operation and manual operation in the event of automatic control failure.

Training Category	Training Requirements
	b) Illustrate by example the day to day operation of the Works and procedures. c) Illustrate by example the actions to be taken in the event of potential process problems, alarms, plant failures, overflows, power failures etc. (as identified in the 'what if' scenario off the job training). d) Illustrate by example the first line mechanical maintenance. e) Illustrate by example safety procedures to be followed in operation, maintenance and cleaning of the Works, as well as emptying tanks and other parts of the Works and bringing units into operation following emptying/decommissioning.
c) On the Job Training Programme for Electrical Maintenance Staff	a) Carry out detailed tour of the electrical plant. b) Illustrate by example the operation of the electrical plant. c) Illustrate by example the electrical isolation and maintenance procedures. d) Illustrate by example fault finding and repair procedures. e) Illustrate by example switching and safety procedures to be followed. f) Illustrate by example safe systems of work.
d) On the Job Training Programme for Control and Instrumentation Maintenance Staff	a) Illustrate by example the operation of the Works. b) Illustrate by example the control and instrumentation maintenance requirements of the Works. c) Illustrate by example fault finding and repair procedures. d) Illustrate by example fault finding on PLC based control systems, the central HMI SCADA hardware and software and other specialist hardware and software systems used on the plant. e) Illustrate by example safe systems of work.
e) On the Job Training Programme for Mechanical Maintenance Staff	a) Illustrate by example the routine mechanical maintenance requirements of the Works. b) Illustrate by example lubrication procedures. c) Illustrate by example fault finding, repair and overhaul procedures. f) Illustrate by example safe systems of work.

15.1.4 Training Programme

Mandatory training occasions for various training category are listed in Table 15. 3: .

Table 15. 3: Training Programme

Type of Training	Training Programme
Off the Job Training for various training category as listed in Table 15. 1.	1) Training programme shall be conducted prior to issue of the Commissioning Certificate for Works or any Section of the Works. 2) Training programme shall be conducted prior to start of the first joint inspection of the plant at the time of Handover. (Refer Part 17)

Type of Training	Training Programme
On the Job Training for various training category as listed in Table 15. 2:	1) Training programme shall be conducted after issue of the Commissioning Certificate for Works or any Section of the Works. 2) Training programme shall be conducted after the approval of second joint inspection report of the plant at the time of Handover. (Refer Part 17)
Annual Training Programme	1) Annual training programme shall be conducted for all O&M staff and Employer nominated Engineer covering some of basic information: - Training on Health and Safety. - Structured communication plan. - Revisiting basic process information. - Standard O&M calculations. - Using Simulation Model for improving plant performance. - Optimization of power and chemical consumption. - Lessons learnt from previous year of O&M. - Training on All aspects of O&M Works. - Training on PLC and SCADA. - Training on plantation and landscaping and keeping pleasant and neat environment of build out campus. - Making innovation in routine work. - Path Forward.

The Contractor shall provide a training plan for each category of staff. The training plan shall detail the content and duration of each course. The training plan shall be submitted for the approval of the Engineer at least 90 days prior to the commencement of the Tests on Completion of Design-Build. The duration of training offered for each category of staff shall not be less than that detailed in the following table.

Table 15. 4: Minimum Training Duration Requirements at Each Training Programme

Category of Staff	Minimum days duration for each course	
	Off the Job Training	On the Job Training
All staff	1	1
Plant Operator	3	5 (see note)
Electrical technician/electrician	3	3
Control/instrument technician	5	3
Mechanical technician/fitter	3	3
Plant Manager	3	(see note)

Notes:

1) It is assumed that for the Plant Manager on the job training will be continuous throughout the initial 12 months of the Operation Service Period and intermittently/as required thereafter.

2) On the job training of the Plant Engineer/Operators who are assigned by the Employer to work full time during the Operation Services Period (including replacement staff) shall be provided

Category of Staff	Minimum days duration for each course	
	Off the Job Training	**On the Job Training**
continuously throughout the initial 12 months of the Operation Service Period and intermittently as required by the Employer thereafter. (Refer Paragraph 15.4) *3) The training day shall be assumed to be not less than 6 hours split into two sessions.* *4) The "Off the job" training rooms shall be provided by the Employer in the existing buildings or another suitable location. However, Contractor shall provide facilities for training which shall include inter alia tables and chairs, projectors, white/black boards, training aids etc.,* 5) *Where trainees of a given category can all be released from their Works operational duties simultaneously, they may be trained together. Where this is not possible the Contractor shall repeat the complete course for those who could not attend.*		

15.1.5 Training Personnel

The Contractor shall provide suitably qualified trainers to carry out the 'off the job' and 'on the job' training. The trainers are to be experienced in treatment plant management, process control, operation and maintenance and troubleshooting in their relevant discipline and in the training of skilled and unskilled staff.

The Contractor shall submit the curriculum vitae of the nominees to the Engineer for approval at least 90 days prior to the commencement of the Tests on Completion of Design-Build. The training experts/trainers shall be fluent in both English and Kannada or the Contractor shall provide the services of an interpreter during the training periods.

15.2 Advisory Requirements

15.2.1 General

The Contractor shall provide personnel to advise in the operation of the Works for a period of 1 year (expect for the advisor to the treatment works manager) after issue of the Commissioning Certificate for Works or any Section of the Works. The personnel provided shall have proven experience in their intended roles. Those persons provided shall comprise:

Advisor to the treatment works manager	**:**	Duration 24 months.
Advisor mechanical maintenance	**:**	Duration 6 months and thereafter intermittently over a period of 12months.
Advisor electrical/control maintenance	**:**	Duration 6 months and thereafter intermittently over a period of 12months.
Advisor process	**:**	Duration 6 months and thereafter intermittently over a period of 12months.

The electrical/control, mechanical and process specialist/advisor visits shall be split; the first visit to establish the procedures and implement, the second visit to monitor and refine the procedures.

The Contractor's personnel will be assisted by staff trained by the Contractor and provided in sufficient numbers to the Employer.

The role of the Contractor's advisory personnel shall be to:

- To advise on day to day management of the sewage treatment plants
- To advise on the development procedures for the ordering and reordering of consumables.
- To propose and develop systems to monitor the consumption of consumables and power and to advise actions to reduce their usage to a minimum.
- To establish analytical procedures within the laboratory and carry out periodic checks to ensure that they are adhered to.
- To establish routines for the analysis of raw sewage, treated effluent quality and sludge quality and other parameters and to establish procedures for corrective action in the event of effluent quality falling below that required.
- To establish systems for the recording of the above parameters appropriate to a plant of this type
- Ensure procedures for operation and planned maintenance of the Works as detailed in the O & M Manuals are carried out and advise on improvements to the Manuals based on operational experience (refer also to final item).
- Advise on the optimisation of process settings, dosage rates, operating regimes etc, taking into account the increase in flows and pollution loads over time and the performance of the secondary treatment.
- Provide continuing informal on the job training to the Employers staff (this is in addition to formal training requirements detailed in bid document).
- Update the O & M Manuals in line with experience gained during the year's operation.

15.2.2 Advisory Personnel

The Contractor shall provide suitable personnel to provide advisory services. The advisors shall be experienced in treatment plant and pumping station management, operation and maintenance in their relevant discipline.

The Contractor shall submit the curriculum vitae of the advisory nominees to the Engineer 90 days prior for the approval. Prior to mobilisation, the advisors shall be fluent in both Kannada and English or the Contractor shall provide the services of an interpreter/s during the advisory period as necessary.

15.2.3 Capacity Building

This Operation & Maintenance manual shall be provided by the Contractor to establish guidelines for plant operator to understand the new Sewage Treatment Plants to operate these efficiently and successfully.

The guidelines will be provided to the training personnel on how to operate the Plant so that they shall be able to manage to treat sewage to the quality required; with less consumption of energy; with less cost of maintenance expenses; providing a long life of equipment; protection against accident, safe working methods and protecting systems from damages under all flow and pollution load conditions.

The system operation and unit operation of individual components may need to be adjusted and modified depending on the raw sewage characteristics and flows and the required data shall be collected during the training program as well as during the operation and maintenance period.

The Contractor shall train the Employer personnel about Plant operation knowledge, abilities and skill as follows:

Table 15. 5: Training Requirement for Capacity Building

Area of Capacity Building	Training Requirements
Knowledge	- System flow and unit operation, maintenance, pumps, blowers, sludge dewatering, other plant equipment and machinery. - Basic Sewage Treatment Process. - Basic sludge handling principle and its characteristics. - Basic maintenance period and work sheet. - Basic laboratory techniques to make standardized tests. - Avoiding any chance of accident, and - Safety and Health.
Abilities	- Make adjustments to sewage treatment process according to raw sewage characteristics and flows, diurnal fluctuation in flow and control thereof. - Equipment/feed pumps calibration techniques. - Make adjustments to control the chemical dosing systems, including the need to use alum to supplement biological phosphorus removal. - Use of/bypassing disc filters considering quality of effluent from secondary treatment. - Adjust chlorination process, and to read and follow written and oral instructions. - Perform standardized laboratory tests. - Make repairs and/or adjustments to equipment and to keep records and prepare reports including graphical representation of data. - Make repairs and/or adjustments to each equipment and to keep records and prepare reports. - Handling safety valves and associated pipelines. - Read and interpret gauges and recording devices used in the sewage treatment plant Usage of safety Equipment in case of Emergency.

15.2.4 Tasks of Operation and Maintenance Works

Tasks of maintenance and operation works shall include but not necessarily be limited to the following:

- Operate sewage treatment plant under normal conditions such as equipment, machinery and pipe line, including valves, gates, stop-logs, pumps, screens, grit removal, aeration, blowers, pumps, clarifiers, disc filters, chlorination, dewatering equipment, chemical and polyelectrolyte preparation and dosing systems, reading flow meters; regulate sludge wasting, disposing of sludge.
- Select the treatment facility or equipment to meet actual performance in case of for example use of disc filters.
- Take samples and make standardized laboratory tests if and as required.
- Set the system/equipment to adjust timer or operation period where necessary.
- Makes minor repairs and adjustments to machinery, equipment, pipes and other materials pertinent to the operation of the plant.

- Work on troubleshooting.
- Maintain maintenance and operational records.
- Cleaning of machinery, equipment and civil tanks, buildings, loading and unloading of materials and storage of chemicals properly.
- Carry out general maintenance of the plant, including, but not limited to, painting, general custodial work, maintenance of equipment, checking condition of boundary wall and CCTV, check for leakages, potential damage from trees and tree roots, etc.
- Assist in repairing flow meters and pipelines including valves in inactive time and/or operation time.
- Assist in the inspection of all necessary equipment, sampling equipment and pipelines.
- Maintain hygienic standards in acceptable condition.
- Maintain plantation & horticultural activities to give pleasant environment of the build out campus.

15.2.5 Operation and Maintenance Manual

The operation and maintenance manual shall include but not necessarily be limited to the following:

Table 15. 6: Information to be covered in the Operation and Maintenance Manual

Information	Details to be included
1) Background of project.	- Complete project background shall be included in manual.
2) Plan and design condition.	- As per approved designs.
3) System operation indices and unit operation indices.	- As per approved designs.
4) Raw Sewage Quality & Quantity (Inlet / outlet).	- Site Actual. - Standard Requirement.
5) Outline of system operation (Civil, Mechanical & Electrical).	- Summary. - Flow diagrams, plan view, hydraulic profile, Piping isometrics. - Operation flow diagram. - Table of facilities. - (Tag number, Type, Number, Nominal bore, capacity, motor rating, and weight).
6) Outline of component and its aim (Civil & Mechanical).	- Normal operation. - Emergency operation. - Selection of facility. - Selection of Auto/Manual mode. - Notice of danger/peril/hazard.
7) Verification items of system operation mode (Civil & Mechanical).	- Before start of system operation. - Start of system operation. - During regular operation. - Set value of level sensors and safety pressure on safety devices. - Position of plant/equipment on the selected mode.

Information	Details to be included
	- Remove potential danger/peril/hazard.
8) Detail of facility/equipment component (Civil & Mechanical).	- Summary. - Specification. - Outside dimension. - Weight, quality of material. - Outside drawing. - Graph, charts, performance curve, table. - Photo after installation. - Notice of danger/peril/hazard.
9) Verification items of component operation (Civil & Mechanical).	- Preparation before the operation. - Starting operation flow. - Normal operation. - Set value of level sensors and safety valves. - Emergency maintenance. - Notice of danger, peril, hazard.
10) Outline of component and its aim (Electrical).	- Verify incoming power Hz, kWh. - Ordinary line or Emergency line operation. - Detail and full operation procedure. - Select standby generator. - Emergency operation. - Selection of facility. - Notice of danger/peril/hazard.
11) Verification items of system operation mode (Electrical).	- Before start of system operation. - Start of system operation. - Set value of level sensors and protection. - Select Auto/Manual mode on central control panel. - Remove potential danger/peril/hazard.
12) Detail of facility component (Electrical).	- Summary. - Specification. - Single line diagram. - Panel dimension. - Weight, quality of material. - Outside drawing. - Graph, charts, performance curve, table. - Photo after installation. - Notice of danger/peril/hazard.
13) Facility verification items (Electrical).	- Preparation before the operation. - Select Normal operation or Emergency operation. - Select equipment operation mode/switch by Auto /manual. - Before start of system operation.

Information	Details to be included
	- Start of system operation. - Set value of level sensors and protection. - Remove potential danger/peril/hazard. - Notice of danger/peril/hazard.
14) Standard.	- Water quality at inlet and outlet. - Emission control. - Noise and vibration.
15) Fire/explosion protection.	- Fire Safety - Mock Drill
16) Dewatered cake sludge handling/disposal.	- Site Actual. - Standard Requirement.
17) Frequency of sampling, analysis and evaluation.	- Inflow and outflow Quality /flow rate. - Regulated pollutants. - Operation index. - Amount of sludge and its density. - Sewage / sludge temperature.
18) Maintenance schedule (Mechanical & Electrical).	- Routine work. - Regular work. - Manufacturer recommendation.
19) Maintenance schedule (Civil).	- Routine work. - Regular work. - Manufacturer recommendation.
20) Calculation sheets	- Calculation of dosing amount (Alum/Chlorine/Poly/etc). - Calculation of sludge amount and characteristics.
21) Troubleshooting guide (Phenomenon/action/comments).	- Effluent quality, bulking and foaming. - Process and system control. - Mechanical equipment. - Electrical equipment. - Case study or/and previous experiences (Normal troubleshooting).
22) Operation / test data.	- Operation index. - Mechanical site inspection data. - Electrical site inspection data. - Water quality and quantity (inlet/outlet). - Regulated pollutants. - Amount of sludge and its density. - Amount of cake and its density. - Noise and vibration. - Water / sludge temperature.

Information	Details to be included
	- Power /chemical consumption. - Operation cost during training period. - Performance test of pressure control valves, pressure reducing valves. - Consumables, spare parts and its list. - Photos of inspection (evidence).
23) List.	- Equipment control. - Operation record formats. - Maintenance record formats. - Material control. - Inventory. - Spare parts. - Safety and Health.

15.3 Prices for Training and Advisory

The Contractor, at the time of bidding, will be responsible to ensure the completeness and adequacy of his Bid Price to fulfil the entire responsibilities as described above. His bid price, as quoted on a yearly basis in the Schedule of Prices, shall include all costs towards the training requirement.

15.4 Employer's Plant Operator

During 7 years Operation and Maintenance period of STP, Employer may/might appoint one Plant Operator (General shifts) for STP in addition to contractor's operational staff. This Employer's Operator should be trained by the Contractor on his own cost; further Contractor should make Employer's Operator involved in all day-to-day Operation and Maintenance activities of STP, such that Employer's Operator should be competent to take over Operation and Maintenance of STP during handing over period.

Employer's Operator shall report to concerned Engineer from Employer and wages towards Employer's Operator shall be directly paid to Employer's Operator from Employer.

Contractor shall make note that Employer's Operator is not authorised to certify any of the Contractor's monthly O&M bills, however Employer's Operator responsibilities shall be similar to the responsibilities of Plant In charge and/or Plant Manager.

End of Part 15